APPENDIX B

FISH AND WILDLIFE RESOURCES TECHNICAL BACKGROUND DOCUMENT

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FISH AND WILDLIFE RESOURCES

The purpose of this technical report is to provide background data on aquatic and wildlife resources to support the draft Environmental Impact Statement (EIS) for small-scale suction dredging in the Clearwater National Forest in north-central Idaho. Two areas are proposed for small-scale suction dredging: the Lolo Creek and Moose Creek project areas. These drainages have had past mining activity under the authority of the 1872 Mining Law. Detailed descriptions of these two project areas and associated mining activity are presented in the EIS chapters 2 and 3.

Under the Endangered Species Act (ESA), the National Marine Fisheries Service (NOAA Fisheries) and the U.S. Fish and Wildlife Service (USFWS) listed steelhead trout and bull trout, respectively as threatened species. The Forest Service has consulted with NOAA Fisheries and the USFWS regarding the potential effects that Forest activities might have on these species. Section 7 Watershed Biological Assessments were prepared for both Lolo Creek (USFS 1999) and Moose Creek (USFS 2000). The Clearwater National Forest also initiated the process of consulting with NOAA Fisheries and USFWS concerning the effects of small-scale suction dredging on these threatened species. In a Biological Assessment (BA) completed by the Clearwater National Forest (USFS 2002a), the determination was made that suction dredging was "likely to adversely affect" steelhead trout, but was "not likely to adversely affect" Lolo Creek bull trout. In the BA for Moose Creek (USFS 2002b), the Forest Service determined that suction dredging was "likely to adversely affect bull trout". In their respective Biological Opinions (BOs), NOAA Fisheries (NOAA 2003) and USFWS (2003) agreed with the Forest Service determinations. Both agencies further concluded that suction dredging would not jeopardize the continued existence of either species if specific conservation measures minimizing impacts to streams and minimizing take were adopted. These conservation measures are adopted as part of the proposed action evaluated in the EIS.

There are numerous relevant environmental studies and reports available for the Lolo Creek and Moose Creek project areas. This technical report focuses on those fish and wildlife species that are of most concern that have the potential to be affected by small-scale suction dredge operations. In addition, data for the affected portion of the streams where suction dredge activities are expected to occur are summarized herein. Additional details for each watershed and nearby drainages can be obtained from the documents listed in Table 1 and cited in the reference section.

1.0 FISH

Known fish species in the project areas area include westslope cutthroat (*Oncorhynchus clarki lewisi)*, steelhead/rainbow (*O. mykiss*), bull (*Salvelinus confluentus*), and brook (*S. fontinalis*) trout, spring chinook salmon (*O. tshawytscha*), and kokanee salmon (*O. nerka*) (land-locked sockeye salmon). Mountain whitefish (*Prosopium williamsoni*) and Pacific lamprey (*Entophenus tridentatus*) occur in very low numbers in the mainstem of Lolo Creek (USFS 1999). In addition, a wide variety of aquatic-dependent insects, amphibians, and mammals occur that are dependent on these streams. These non-game species provide a major food source for both aquatic and terrestrial animals.

Table 1. Selected Biological Reports Pertaining to the Lolo Creek and Moose Creek Watersheds

Title	Reference
Lolo Creek	
Biological opinion on recreational suction dredge mining in Lolo Creek – Endangered Species Act Section 7 consultation	NOAA Fisheries, 2003
Proposed recreational suction dredging during 2002-2003 in the Lolo Creek drainage	USFWS 2002
Biological assessment: threatened, endangered, and proposed species, recreational suction dredging on USFS Lands in the Lolo Creek drainage	USFS 2002a
Section 7 watershed biological assessment of the Lolo Creek drainage. Determination of effects and proposed activities based on the matrix of pathways and indicators of watershed condition for steelhead, fall chinook salmon, and bull trout	USFS 1999
Habitat conditions and salmonid abundance in Lolo Creek – summer 1998	Clearwater BioStudies, Inc. 1999a
Habitat conditions and salmonid abundance within Lolo Creek drainage – summer 1997	Clearwater BioStudies, Inc. 1997
Nez Perce Tribal hatchery program final environmental impact statement	USDE 1997
Clearwater subbasin ecosystem analysis at the watershed scale	USFS 1997
Fisheries survey reports for Lolo Creek, Eldorado Creek, Musselshell Creek, and Yoosa Creek tributaries	Isabella Wildlife Works 1995a,b,c,d
Habitat conditions and salmonid abundance in Lolo Creek – Summer 1993	Clearwater BioStudies, Inc. 1994
Habitat conditions and salmonid abundance in Eldrorado, Yoosa and Camp Creeks – summer 1992	Clearwater BioStudies, Inc. 1993a,b
Habitat conditions and salmonid abundance in selected streams in Musselshell Creek and Cedar Creek – summer 1991	Clearwater BioStudies, Inc. 1992a,b
Fish habitat characteristics and salmonid abundance in the Lolo Creek study area – summer 1988	Clearwater BioStudies, Inc. 1988
Moose Creek	
Biological opinion on recreational class suction dredge mining in the Moose Creek – ESA Section 7 consultation	USFWS 2003
Biological assessment: threatened, endangered, and proposed species, recreational suction dredging on USFS Lands in the Moose Creek drainage	USFS 2002b
Section 7 watershed biological assessment of the North Fork Clearwater drainage. Determination of effects of ongoing and proposed activities based on the matrix of pathways and indicators of watershed condition for bull trout	USFS 2000
Habitat conditions and salmonid abundance in selected tributaries to Moose Creek – summer 1998	Clearwater BioStudies, Inc. 1999b

Table 1. Selected Biological Reports Pertaining to the Lolo Creek and Moose Creek Watersheds (Cont.)

Title	Reference
Lolo Creek	
Beneficial use reconnaissance project survey of Pollock Creek, 1999	IDEQ 1999
Summary of snorkeling observations in the North Fork Clearwater drainage, 1993-1997	IDFG 1998
North Fork Clearwater River Basin – Bull trout problem assessment	CBBTAT 1998
Beneficial use reconnaissance project survey of Little Moose Creek	IDEQ 1998
Fisheries survey report, Osier Creek drainage	Isabella Wildlife Works 1996
Biological assessment for bull trout, North Fork Clearwater River key watershed analysis area	Murphy *et al*. 1995
Habitat conditions and salmonid abundance in China and Laundry Creeks – summer 1994	Clearwater BioStudies, Inc. 1995
Habitat conditions and salmonid abundance in selected streams within the Moose Creek drainage – summer 1990	Clearwater BioStudies, Inc. 1991
Habitat conditions and salmonid abundance in the Swamp Ridge area – summer 1989	Clearwater BioStudies, Inc. 1990

Fish species in headwater reaches of the Clearwater River such as westslope cutthroat, bull trout, sculpins (*Cottus sp*.), dace (*Rhinichthys sp*.), and suckers (*Catostomus sp*.) generally require cooler water temperatures, feed primarily on aquatic and terrestrial insects, and are limited in numbers by physical factors such as the availability of pools and cover. Bull trout and westslope cutthroat occur in two distinct life history forms: a resident type which grows slowly and rarely exceeds 10 to 12 inches; and a fluvial type (migrate downstream to feed in larger rivers) that commonly reach 12 to 16 inches in length.

Downstream of the headwater zone and extending all the way to the tributary mouths of the main forks of the Clearwater River, the fish assemblage transitions to one dominated by steelhead, chinook salmon, older cutthroat and bull trout, and mountain whitefish. The change appears to be a function of the local thermal regime. Species found at lower elevations tend to be more temperature tolerant, are either omnivorous or large invertebrate-fish predators, and are regulated in number to a greater degree by biological rather than by physical factors (Li *et al*. 1987).

Westslope cutthroat trout population trends are described in Section 1.2.1. This species is well distributed throughout the drainage and occurs in relatively high numbers in some streams.

Brook trout is a non-native species that is highly competitive with the native species for food and spawning habitat. In addition, larger adults often feed on juvenile steelhead, westslope cutthroat, and/or chinook salmon. Brook trout can also spawn with bull trout creating sterile hybridized offspring. Populations of brook trout occur in random locations in Lolo Creek and appear to be relatively stable (USFS 1999). Brook trout have not been found in Moose Creek.

The basic life history of resident salmonids in the project area streams begins when eggs are deposited in a “redd” (suitable spawning gravel excavated by the adult salmonid), fertilized, and covered with gravel. Following an incubation period ranging from six to 30 weeks (depending on the species and water temperatures), sac fry (alevins) remain in the gravel for varying periods of time before emerging. After emergence, juveniles forage on progressively larger organisms, growing for two to four years to sexual maturity.

1.1 Threatened Fish Species

1.1.1 Chinook Salmon (Oncorhynchus tshawytscha)

The National Marine Fisheries Service (NMFS) listed two stocks of the Snake River chinook salmon (the spring/summer and the fall chinook salmon) as threatened on April 22, 1992 (57 FR 14653). Critical habitat for these two stocks of chinook salmon was designated on December 28, 1993 (58 FR 68543) and revised on October 25, 1999 (64 FR 57399).

Critical habitat for the fall-run chinook includes only the mainstem of the Clearwater River up to the Idaho/Clearwater county line below the town of Greer, Idaho. Most of the fall chinook salmon spawning over the last five years has occurred within the designated critical habitat areas, generally in the Clearwater River downstream of the North Fork Clearwater River. Some limited spawning has been observed near the confluence of Lolo Creek. Fall chinook spawning near Lolo Creek is sporadic and not considered a viable/natural sustaining population (due to natural

constraints regarding rearing habitat, water temperatures during incubation and early rearing). Increased number of spawners over the past five years is due to supplementation efforts (USFS 2002a).

Critical habitat for spring/summer chinook salmon does not include tributaries of the Clearwater River, therefore, spring/summer chinook are only considered as a sensitive species in the Lolo Creek project area.

Distribution in Lolo Creek. Spring chinook salmon, because of their large size, usually spawn in mainstem rivers and larger streams where gradients are low, and riffles contain large expanses of gravel/rubble (3-6" diameter). Areas with concentrated spawning include Lolo Creek above Musselshell Creek and in Yoosa Creek. Juvenile rearing occurs throughout the mainstem Lolo Creek, Yoosa below Camp Creek, and the lower reaches of Nevada Creek Juvenile spring chinook salmon prefer pools for rearing.

State, federal, and Nez Perce Tribe hatchery supplementation (stocking) of spring/summer chinook adults in Lolo Creek over the last ten years has substantially increased the number of juveniles in the drainage, with current densities of juvenile spring chinook salmon at 69/100m^2 and 61/100m^2 for 2001 and 2002, respectively, for 15 permanent snorkeling stations in Lolo Creek (USFS 2003a).

No historical records or current documentation of fall chinook salmon spawning or rearing within the Lolo Creek watershed are available (USFS 2002a). The mouth of Lolo Creek on the mainstem of the Clearwater River is the upstream boundary of designated critical habitat for fall chinook. Distance from the proposed suction dredging in Lolo Creek to the Clearwater River is over 25 miles. Consequently, no critical habitat for fall-run chinook occurs within the Lolo Creek project area.

Distribution in Moose Creek. The Moose Creek drainage is located over 100 miles upstream of Dworshak Dam. The dam provides a complete migration barrier to anadromous fish and both runs of chinook salmon do not occur there.

1.1.2 Steelhead (Oncorhynchus mykiss)

On August 18, 1997 (62 FR 43937), steelhead trout were listed as a threatened species within the Snake River Basin under the Endangered Species Act (ESA).

General Characteristics. Snake River Basin summer steelhead consist of two groups, an A-run and B-run. These runs are separated based on migration timing, ocean-age, and adult size. A-run Snake River Basin steelhead enter fresh water from June to October and spawn from March to May the following spring. B-run steelhead, which occur in the Clearwater River Basin, enter fresh water from late August to October, passing Bonneville Dam after August 25. B-run steelhead are thought to be generally age-2 ocean fish. B-run steelhead are 75 to 100 mm longer than A-run steelhead trout of the same age due to their longer ocean residency. Unlike most anadromous salmonids, some steelhead are capable of spawning more than once before they die. However, most surviving steelhead in the Clearwater Basin spawn only once (NOAA 2003).

Spawning and initial rearing of juvenile steelhead generally take place in moderate stream gradients, generally from 3 to 5 percent. Eggs deposited in redds hatch in about 35-50 days, depending upon water temperature. Alevins remain in the gravel 2 to 3 weeks until the yolk sac is absorbed, then emerge as fry in late spring, and begin to actively feed. Egg to fry survival is usually near 15 percent. Steelhead usually smolt as 2 or 3 year olds and migrate to the ocean (Busby *et al*. 1996)

Productive steelhead habitat is characterized by complexity, primarily in the form of large and small wood and boulders. Juveniles will take advantage of microhabitats to seek refuge from high water velocity and/or temperatures. Juveniles may move around in a basin to take advantage of favorable habitat. Steelhead fry prefer protected and complex edge habitat with low water velocity (<0.3 ft/s) and depths generally less than 15 inches deep. Summer rearing takes place primarily in the faster parts of small and deep scour pools with wood or medium to large substrate (cobble or boulders) as cover. Other important summer habitat components used by juveniles are pools with turbulent cover, undercut/scoured streambanks, and pocket water in deep riffles and rapids. Winter rearing occurs more uniformly at lower juvenile densities across a wide range of fast and slow habitat types. Small tributaries and lakes are probably important winter habitat. As juveniles get older, some tend to move downstream to rear in larger tributaries and mainstem rivers (USFS 2002a)

Distribution in Lolo Creek. The Lolo Creek drainage produces very few steelhead due to overall low adult escapement and "poor" habitat conditions. Steelhead production is most likely a combination of wild/natural and hatchery production because of adult and juvenile hatchery plantings over the past 20 years. Steelhead mostly spawn in the mainstem of Lolo Creek (from Musselshell Creek to Yoosa Creek) and any accessible tributaries in upper Lolo and Yoosa creekse. Fish population surveys over the past 15 years have documented juvenile steelhead at most sampling sites throughout the mainstem Lolo Creek (Table 2), with average densities of 0.51, 0.33, and 0.95 fish/100m in 1996, 1998, and 1999, respectively (USFS 2002a). In general, the number of spawning wild steelhead in Lolo Creek is around 100 spawning pairs in any given year (USFS 2002a).

Distribution in Moose Creek. The Dworshak Dam, located approximately 100 miles downstream of the Moose Creek dredging areas, is a complete migration barrier to steelhead.

1.1.3 Bull Trout (Salvelinus confluentus)

On June 10, 1998 (63 FR 31647), bull trout were listed as a threatened species within the Snake River under the ESA. Historical and current information regarding the physical and biological characteristics of the Lolo Creek and Moose Creek watersheds are presented in the biological assessments (USFS 2002a,b) and in the section 7 watershed biological assessments (USFS 1999, 2000).

Table 2. Summary of Steelhead Observations in the Lolo Creek Drainage [a]

Stream/Reach	Number of Fish Sampling Stations	Number of Stations with Steelhead
Lolo mainstem [b]	214	207
11 Lolo tributaries [c]	18	2
Yoosa Creek [c]	39	30
Lolo mainstem [d]	15	15
Lolo mainstem [e]	47	46
Lolo mainstem [f]	68	58
Yoosa Creek [f]	27	24
Lolo Creek (downstream USFS lands) [g]	3	3

a = Does not include pre 1992 data from IDFG and pre 1988 USFS data.
b = Snorkeling data collected between 1988 and 1999 and 2001 by USFS personnel or Clearwater BioStudies, Inc.
c = Snorkeling and/or electrofishing data collected between 1991 and 1997 by USFS personnel, Clearwater BioStudies, Inc., or Isabella Wildlife Works.
d = U.S. Fish and Wildlife Service – Idaho Fishery Unit: Snorkeling data from 1987-1988, and 1990-1991. Two bull trout were observed during the 1987 survey on mainstem Lolo Creek (between White Creek and Yoosa Creek).
e = Idaho Department of Fish and Game: Snorkeling data from 1985 (Petrosky and Holubetz 1986), and 1994 (Hall-Griswold et al. 1995).
f = Nez Perce Tribe snorkeling data from 1993 (USFS 2002a as cited from Hesse and Arnsberg 1994, 1995).
g = U.S. Bureau of Land Management (USBLM 2000) snorkeling data from three sites in Lolo Creek downstream of USFS lands (stream miles: 0.9, 6.7 and 22.0).

General Characteristics. Bull trout populations in the Lolo and Moose creek drainages are generally considered resident and/or fluvial. Adult bull trout spawn in the upper portions of the watersheds, with preferred spawning habitat generally consisting of low gradient stream reaches, intermixed in high gradient reaches, that have loose, clean gravel (Fraley and Shepard 1989) and water temperatures of 5 to 9° C (41 to 48° F) in late summer to early fall (Goetz 1989). Bull trout typically spawn from August to November during periods of decreasing water temperatures. Depending on water temperature, egg incubation is normally 100 to 145 days (Pratt 1992), with juveniles remaining in the substrate after hatching, although time from egg deposition to emergence may surpass 200 days. Fry normally emerge from early April through May depending upon water temperatures and increasing stream flows (Pratt 1992; Ratliff and Howell 1992).

Distribution in Lolo Creek. Between 1974 and 2000, very few bull trout were observed during snorkeling and electrofishing fish monitoring surveys in the Lolo Creek drainage. The Clearwater Basin Bull Trout Technical Advisory Team (CBBTAT 1998) reported that the USFWS, IDFG, and Nez Perce Tribe observed several bull trout during snorkeling surveys in the mainstem of Lolo Creek between 1987 and 1994. However, bull trout were not observed by these agencies or by the Forest Service during fish monitoring in 1996-1998 and bull trout were not observed by the Forest Service in 2002. In addition, bull trout have not been observed in the Eldorado Creek, Musselshell Creek or Yoosa Creek drainages. The extent of bull trout spawning

and production is considered very low (Table 3). Habitat conditions and warmer temperature regimes appear to limit bull trout production in the Lolo Creek drainage.

Table 3. Summary of Bull Trout Observations in the Lolo Creek Drainage [a]

Stream/Reach	Number of Fish Sampling Stations	Number of Stations with Bull Trout	Bull Trout Age Classes and Densities
Lolo mainstem [b]	214	0	
11 Lolo tributaries [c]	18	0	
Yoosa Creek [c]	39	0	
Lolo mainstem [d]	15	2	Two juvenile bull trout; 1-4" and 1-5" in 1987.
Lolo mainstem [e]	47	0	
Lolo mainstem [f]	68	3	One juvenile bull trout 1993 and two juvenile bull trout 1994.
Yoosa Creek [f]	27	0	
Lolo Creek (downstream USFS lands) [g]	3	1	One 6-9" bull trout sighted at station #2

a = Does not include pre 1992 data from IDFG and pre 1988 USFS data.
b = Snorkeling data collected between 1988 and 1999 and 2001 by USFS personnel or Clearwater BioStudies, Inc.
c = Snorkeling and/or electrofishing data collected between 1991 and 1997 by USFS personnel, Clearwater BioStudies, Inc., or Isabella Wildlife Works.
d = U.S. Fish and Wildlife Service – Idaho Fishery Unit: Snorkeling data from 1987-1988, and 1990-1991. Two bull trout were observed during the 1987 survey on mainstem Lolo Creek (between White Creek and Yoosa Creek).
e = Idaho Department of Fish and Game: Snorkeling data from 1985 (Petrosky and Holubetz 1986), and 1994 (Hall-Griswold et al. 1995).
f = Nez Perce Tribe snorkeling data from 1993 (USFS 2002a as cited from Hesse and Arnsberg 1994, 1995).
g = U.S. Bureau of Land Management (USBLM 2000) snorkeling data from three sites in Lolo Creek downstream of USFS lands (stream miles: 0.9, 6.7 and 22.0).

Presently, westslope cutthroat trout is the dominant fish species in the headwater streams of Lolo Creek, with strong populations of brook trout in the Musselshell Creek drainage a few scattered brook trout populations in the Yoosa Creek drainage. Overall, the fish population data does not indicate any bull trout spawning and early rearing in the Lolo Creek drainage over the past several years.

Distribution in Moose Creek. Moose Creek currently supports a small number of bull trout. Overall, westslope cutthroat trout is the dominant species with low numbers of redband/steelhead trout and bull trout (Clearwater BioStudies, Inc. 1991). Bull trout population information is summarized in Table 4.

A few age 1+ and 2+ bull trout were found in Moose Creek below the confluences with Deadwood and Independence creeks during a 1990 stream survey (Clearwater BioStudies, Inc. 1991). A 1983 re-survey by Moffitt and Bjornn (1984) for the Idaho Department of Fish and Game (IDFG 1998) did not observe bull trout at sampling stations in Little Moose and Ruby creeks. No bull trout were observed in a 1995 survey of the Osier Creek drainage (Isabella

Wildlife Works 1996) and no bull trout were observed during surveys on Ruby and Craig creeks and the Little Moose Creek drainage in 1998 (Clearwater BioStudies, Inc. 1999b).

Table 4. Summary of Bull Trout Observations in the Moose Creek Drainage 1983-2001

Stream	Number of Fish Sampling Stations	Number of Stations with Bull Trout	Bull Trout Age Classes and Densities
Moose Creek – mainstem	28	7	Age 1 = 0.2/100m^2 * Age 2 + = 0.2/100m^2 Age 4 + = 1 fish ** Age 4 + = 3 fish ***
Little Moose Creek [a, b, c]	17	3	
Swamp Creek	3	0	
Osier Creek (mainstem)	8	2	Age 4 + = 2 fish ****
Independence Creek	5	0	
Deadwood Creek [d]	2	0	
Ruby Creek [e]	4	1	Age 1 = 1.3/100m^2 Age 2 = 1.3/100m^2

* In Moose Creek, there were two stations with age 1 bull trout with a density of 0.2/100m^2.
** One adult bull trout observed in mainstem Moose Creek in 2000 directly downstream of Deadwood Creek.
***Three adult bull trout observed in mainstem Moose Creek in 2001; two downstream of Osier Creek and one upstream mouth.
**** Two adult bull trout observed in Osier Creek in 2001, downstream of Swamp Creek.
a = IDEQ survey on Little Moose Creek on 7/29/1998. During their electro-shocking, they captured one (age 4) bull trout (240 – 249 mm) approximately 0.25 miles upstream from the mouth.
b = The Nez Perce tribal fisheries program conducted a genetics survey on westslope cutthroat trout in Little Moose Creek in the summer of 1999. They captured a small bull trout (approx. 50 mm) about one mile downstream from Wapito Creek. They also noted a 3 yr. old bull trout natural mortality near their shocking site (USFS 2002b).
c = IDFG have three snorkel transects in Little Moose Creek that have been surveyed from 1994-1997. They observed no bull trout at these transects.
d = Two stations snorkeled in 2000.
e = IDFG has one snorkel transect in Ruby Creek and have snorkeled this site from 1994-1997. They observed no bull trout during their surveys.

Prior to 2000, the fish observations indicated that limited bull trout spawning and rearing was occurring in the Moose Creek drainage. However, additional snorkeling surveys conducted during 2000-2001 found an increase in the numbers of adult bull trout in the Moose Creek drainage and also documented spawning in the lower Osier Creek drainage. Moose Creek is proposed as critical habitat from its confluence with Kelly Creek upstream 9.5 miles to a gradient break near the headwaters (67 FR 71276, 11/29/02).

1.2 Sensitive Fish Species (Forest Service Designated)

Westslope Cutthroat Trout. The Lolo and Moose creek watersheds support populations of cutthroat trout. In general, cutthroat trout have a wide distribution and are found in streams with 18-inch wide channels. The highest densities are found in the small tributary streams, and in the

mid and upper reaches of the larger streams where competition with other trout or salmon species is limited (USFS 1999). Cutthroat spawning occurs in pockets of 0.5-2 inch diameter gravel in pool tailouts and in runs. Gravel in these pockets is relatively shallow but adequate for egg incubation, which is why cutthroat trout survive in small or headwater streams. Rearing occurs in pools, along stream margins, and in pocket water habitats, depending on the size of the fish.

The westslope cutthroat population in the upper Lolo Creek watershed is considered strong with densities averaging 2.3 (age 2+) fish/100 square meters (Clearwater BioStudies, Inc. 1999a). Designated critical reaches for cutthroat occur primarily in low gradient areas of tributaries and in Lolo Creek above Dutchman Creek. In the Moose Creek watershed, spawning and rearing habitat is present for supporting populations of cutthroat trout.

Spring chinook salmon, also considered a sensitive species, is found in Lolo Creek and was discussed in Section 1.1.1.

1.3 Non-Game Fish Species

Pacific lamprey is a federal species of concern and is listed by the Idaho Department of Fish and Game as a state endangered species. Pacific lamprey have an anadromous life history where young adults migrate to the ocean, remain there for up to 4 years, then return to streams to spawn (April to July), after which time they die. Upon hatching, juvenile lamprey (ammocetes) typically embed themselves in sand-dominated, low gradient channels where they filter-feed and grow. They typically rear in these areas for up to 7 years before migrating to the ocean to become parasitic on various ocean fish (Moser and Close 2003). Some lamprey spawning habitat (low-gradient gravel substrate areas) occurs in the mainstem of Lolo Creek, and data from the Nez Perce Tribe indicates the presence of juvenile and young adult lampreys (USDE 1997). However, lampreys do not occur in the Moose Creek drainage due to the presence of the Dworshak Dam.

Mountain whitefish prefer cold (8-10°C) mountain streams with large riffles or pools averaging 3-4 feet in depth (Lusch 1985). They are primarily bottom feeders with a preference for insects, snails, amphipods and crawfish. Mature whitefish also eat salmonid fry and whitefish eggs. Whitefish are broadcast spawners that require a gravel bottom surface for eggs to adhere. Whitefish occur in very low numbers in Lolo Creek and although the creek provides spawning opportunities, summer water temperatures may limit juvenile survival (USFS 2000).

Sculpins occur in Lolo and Moose creek drainages but there is no information on their abundance and distribution. Sculpins generally prefer small cobble-sized substrate for breeding and non-embedded substrate in run/pool type habitats for cover. They are an important food source for other aquatic and terrestrial animals (USFS 2000).

1.4 Aquatic Invertebrates

The presence, distribution, and abundance of aquatic insects are dependent upon basic habitat constituents such as water temperature, water quality and chemistry, substrate, and flow

conditions. In general, the four most important aquatic insect groups or "orders" that comprise the diet of stream salmonids and many other fish include true flies (order: Diptera), mayflies (Ephemeroptera), caddisflies (Tricoptera), and stoneflies (Plecoptera). Insects from these last three orders are collectively called EPT taxa.

Aquatic insects are a primary food source of juvenile salmon and trout, and are a large part of the diet of resident adult trout and other coldwater fish. Aquatic insects use their habitat in many ways, including clinging to the sides of cobble and boulders not exposed to sunlight, living in crevices and interstices of gravels, or burrowing in mud and sand in stream margins. Most EPT taxa and true flies spend the majority of their life in the aquatic environment, pupate, crawl or fly from the water as winged subadults, and shortly thereafter undergo a final molt into a sexually mature adult. The terrestrial period of life is primarily for mating and egg deposition, and usually ranges from a day (for most mayflies) up to several months.

There are no aquatic invertebrate survey data in the two project areas that are relevant to assessing potential impacts as a result of suction dredging operations or to adequately describe invertebrate baseline conditions within the project areas.

2.0 WILDLIFE

This section provides a general description of wildlife that utilize riparian habitat in the Lolo and Moose creek watersheds.

2.1 Birds

Riparian forests and wetlands along the Clearwater River and larger tributaries provide perching and nesting opportunities and concentrated prey for many raptor species (Asherin and Orme 1978). Of these, only the osprey (*Pandion haliaetus*), northern harrier (Circus cyaneus), and bald eagle *(Haliaeetus leucocephalus)* are directly associated with riparian and wetland habitats. The bald eagle is discussed in Section 2.3.1. Osprey nest along the corridors of the mainstem rivers of the Clearwater basin and although there may be some transitory use of tributaries such as Lolo Creek, osprey are not known to nest there. Northern harriers use meadow areas located in the Lolo Creek watershed. These birds feed mostly on rodents (Asherin and Orme 1978).

Blue heron *(Ardea herodias)* forage and nest along mainstem rivers. Occasionally, they are observed in the larger tributaries of the upland drainages. Belted kingfishers (*Ceryle alcyon*) and dippers (*Cinclus mexicanus*) are relatively common in area tributaries foraging on aquatic insects and fish, and nest in streambanks or nearby slopes. Waterfowl may occasionally use the riparian habitats in the project areas occasionally and during migrations.

Blue (Dendragapus obscurus) and ruffed (Bonasa umbellus) grouse make transitory use of upland riparian habitats. Other upland game birds such as ring-necked pheasant (Phasianus colchicus), mourning doves (Zenaida macroura) , chukar partridges (*Alectoris chukar*), and valley quail *(Lophortyx californica)* may occasionally use the riparian habitats in the Lolo and Moose Creek watersheds.

2.2 Mammals

Aquatic furbearers such as beaver (C*astor Canadensis)*, muskrat *(Ondatra zibethicus)*, fisher (*Martes pennanti)*, mink (Mustela vison), and river otter *(Lutra Canadensis)* occur in the lower Clearwater River corridors and in upland watersheds. In general, these animals depend on riverine areas, bays, ponds, tributaries, and riparian forests for den sites and foraging areas. Riparian zones also serve as dispersal, travel, and prey base corridors (Jones and Heinemeyer 1994).

Beaver are common in the project watersheds and river otter may be found in the lower portions of Lolo Creek. Beaver distribution is strongly related to the presence of riparian food sources such as cottonwood trees and willows plus protected areas such as sloughs, inlets, and ponds (Asherin and Orme 1978). Mink and river otter use slackwater habitats for foraging and denning. Fishers typically use mid-to-late successional forests and riparian zones. These forest types have multilayered canopies which help regulate temperatures and provide suitable denning sites (cavities and downed logs). Raccoons *(Procyon lotor)* frequent stream and riparian habitats and forage on fish and mussels found in the tributary streams.

Big game species such as white-tailed deer (Odocoileus virginianus), mule deer (*Odocoileus hemionus),* elk *(Cervus elaphus nelsoni).* black bear *(Ursus americanus),* cougar *(Felis concolor),* and moose (*Alces alces*) may occur in the project areas. These animals may use riparian corridors to move between summer and winter ranges and sometimes for calving and fawning. During severe winters, riparian habitats can provide cover necessary for survival.

2.3 Threatened and Endangered Wildlife

Bald Eagle (Haliaeetus leucocephalus)

The bald eagle is protected under the ESA (1973), Bald Eagle Protection Act (1940), Migratory Bird Treaty Act (1918), and Lacey Act (1901). The Pacific Bald Eagle Recovery Plan (USFWS 1986) provides strategies to protect and recover bald eagle populations in Idaho. Forest Plan standards direct the Clearwater National Forest to manage active identified bald eagle nesting, roosting, and perching sites to maintain their use and future recovery efforts.

Bald eagles use the Clearwater mainstem corridors during the winter (September through April), which provides suitable winter habitat in the form of perch sites, roost sites, and access to prey. They are not known to frequent the upland tributary networks to any significant degree, mainly because the creeks are usually frozen during winters. In the spring of 1999, an unsuccessful nest attempt was documented nearby to the Clearwater National Forest on Dworshak Reservoir. This location is at least 60 miles from the project area. No historical or current evidence documents nesting or breeding on the Clearwater National Forest. Essential habitat for bald eagles on the Clearwater National Forest is restricted to 0.5 miles on either side of the Lochsa , Middle Fork of the Clearwater and North Fork of the Clearwater rivers, and lower portions of the Weitas, Kelly, and Cayuse creeks, for approximately 175,000 acres of suitable winter habitat.

No use by bald eagles has been documented for the Lolo Creek drainage (USFS 2002a). However, wintering bald eagles are occasionally sighted within the Moose Creek drainage, but no use has been documented (USFS 2002b). Wintering eagles have been observed downstream on the North Fork and mainstem Clearwater rivers. No suction dredge activities are proposed to occur during the winter months when bald eagles may be present in the project area.

Grizzly Bear (Ursus arctos horribilis)

The grizzly bear is protected by the ESA. The revised Grizzly Bear Recovery Plan (USFWS 1993) provides broad recovery objectives for the bear. There have been no confirmed reports of grizzly bears on the Clearwater and Nez Perce National Forests since 1956 (Davis 1994 and USDE 1997, as cited from Blair 1995). Thus there are no grizzly bear in or near the Lolo or Moose creek drainages and they are not expected to inhabit these drainages.

Gray Wolf (Canis lupus)

Under the authority of the ESA, the U.S. Fish and Wildlife Service currently considers the gray wolf nonessential experimental status. Wolves have been translocated from Canada into the Central Idaho Experimental Management Area since January 1995. Strategies to protect and

recover populations are provided in the Northern Rocky Mountain Wolf Recovery Plan (USFWS 1987) and in the final EIS for the reintroduction of gray wolves into Yellowstone National Park and Central Idaho (USFWS 1994). One such management strategy is to limit activities within one mile of active wolf dens or rendezvous sites from March 15 to July 1.

The Lolo and Moose creek drainages are within the boundary of the Central Idaho nonessential population area for the gray wolf. Approximately 10 wolves currently occupy habitat in and adjacent to these areas. There have been no confirmed observations of breeding pairs, pack formation, young pups, dens, or suspected rendezvous sites within the project areas.

Lynx (Lynx canadensis)

The U.S. Fish and Wildlife Service listed the lynx as a threatened species on March 24, 2000 (65 FR 16052). The lynx is a wide-ranging predator that could use the project area on occasion. Nellis (1989) estimated that most home ranges encompass 5 to 20 square miles, but home ranges up to 94 square miles have been reported. Ruggiero *et al*. (1994) reported the lynx occurs primarily in the boreal forest of Alaska and Canada, but its range extends south into the northern portions of the western mountains that support similar boreal forest habitats. Detailed descriptions of habitat use and management objectives for the lynx is provided in the Canada Lynx Biological Assessment (USFS 2001). There have been only nine lynx sightings in Clearwater County recorded between 1942 and 1995 (USFS 2001). Project areas are not within suitable lynx habitat.

2.4 Sensitive Wildlife and Management Indicator Species (Forest Service Designated)

This section provides a description of the sensitive wildlife species and wildlife management indicator species within the Clearwater National Forest. Most of these species are listed as a federal or state species of concern deserving of greater management scrutiny. The habitat requirements for these various species range from a few acres to hundreds of square miles. Table 5 provides a list of the species, a brief description of their habitat, and their likelihood of occurrence in the project areas affected by small-scale suction dredging.

Table 5. Sensitive Wildlife and Management Indicator Species

Species	Habitat Description	Likelihood of Occurrence [a]
Management Indicator Species		
Elk *Cervus elaphus*	Grasses, forbs and some dryland shrubs provide nutritious forage for elk throughout the summer and into the fall. These areas (often most evident on major ridges and within upland basins) typically support high to moderate habitat use. A large percentage of the pregnant cows calve on broad gentle ridges where seclusion from human disturbance is important.	Elk are widespread in both project areas. The lower and western portions of the Lolo Creek are used by elk during mild winters (USFS 2003). The lower portions of Moose and Kelly creeks provide winter habitat.
Moose *Alces alces*	Moose are wide-ranging, preferring shrubby, mixed coniferous forests with nearby lakes and marshes, and streams. They generally require water bodies for foraging. They browse on new growth of trees and shrubs (e.g., willow, aspen and fir) and on vegetation associated with water. Moose breed in September to late October, and calves are born late May-early June.	Moose are relatively common in the project areas where riparian areas provide both browse forage and dense hiding cover.
White-tailed deer *Odocoileus virginianus*	These deer typically use mixed deciduous/conifer forests near water for dense cover and forage food. They breed in the fall and fawns are born in spring.	Year-round deer habitat is considered moderate to heavy in both project areas.
American marten *Martes americana*	Martens prefer dense, high-elevation grand fir, subalpine forests. They also utilize high elevation riparian areas. Moist habitats of mature lodgepole pine and dense cedar/grand fir forests are utilized at lower elevations. Down logs and snags provide refuge and den sites. The size of a marten's home range is 0.8 to 15.7 km^2 (Ruggiero *et al*. 1994).	Suitable marten habitat is present in upper Lolo creek (USFS 2003), and the Moose Creek drainage.
Pileated woodpecker *Dryocopus pileatus*	Pileated woodpeckers primarily utilize 20 inch or greater diameter-breast-height snags for nesting; however, they are known to forage on large snags and down dead wood, feeding principally on carpenter ants. Pileated woodpeckers tend to avoid open areas for foraging, preferring forests with significant old-growth component and high basal area (USFS 2003).	Pileated woodpeckers are not likely to utilize the riparian areas for nesting, but may occasionally use the vicinity for foraging.
Belted kingfisher *Megaceryle alcyon*	Kingfishers (a neotropical species) are predators of small fish where they hunt by perching over or along the stream. Therefore, fairly wide-open stream courses without significant emergent vegetation and clear water are preferred.	This species is common along Lolo Creek and its major tributaries. It is also expected along Moose Creek.
Sensitive Wildlife Species		
Fisher *Martes pennanti*	Fishers tend to select moist habitats, characterized by dense canopy cover, in mature or late mature stands of lodgepole pine, spruce, subalpine fir grand fir or cedar. Fisher habitat use is typically within 400 m from perennial streams with forested riparian areas, often in proximity to alder glades and small meadows. The primary prey of fishers is small mammals (such as squirrels and snowshoe hare), while carrion is also utilized. The average home range for fishers range from 15 km^2 for females to 40 km^2 for males (Ruggiero *et al*. 1994, p. 43). Most studies suggest that fishers are tolerant of moderate human activities.	Due to the prevalence of fisher habitat in the Lolo and Moose creek drainages, fishers are expected to be relatively common.

Deleted:

Deleted: Species

Table 5. Sensitive Wildlife and Management Indicator Species (Cont.)

Species	Habitat Description	Likelihood of Occurrence [a]
Sensitive Wildlife Species		
Wolverine *Gulo gulo*	Wolverines typically inhabit large areas of medium or scattered mature forest areas around slides, cliffs, swamps and meadows. Habitat types used by wolverines include sub-alpine fir, lodgepole pine, western larch, Douglas fir and mixed conifers. They typically inhabit remote mountainous areas where human disturbance is unlikely. Home ranges for females in Idaho range between 16-516 km^2 (Ruggiero *et al*. 1994).	The riparian areas along the project creeks provide poor habitat and the level of human activity would preclude wolverine use in the affected area.
Townsend's big-eared bat *Plecotus townsendii*	Western big-eared bats are more commonly found in southern Idaho and at much lower elevations than those of the project areas. They are communal and utilize natural caves or old underground mines and, occasionally, old buildings.	There are no caves, buildings, mines, or bridges that appear to meet the criteria for suitable habitat in the project areas.
Northern goshawk *Accipter gentillis*	The Northern goshawk is a forest-adapted raptor that prefers mature coniferous stands with dense canopy cover and mature forest edge. They typically nest in stands of mature or late mature forest that are larger than 25 acres and have relatively dense crown closure. Northern goshawks typically feed on a variety of forest dwelling mammals and birds ranging in size from snowshoe hares to chipmunks.	Riparian zones along the project areas are not suitable for nesting. However, this species has been sighted in the Lolo Creek watershed and is also expected to be present in the Moose Creek drainage.
Flammulated owl *Otus flammeolus*	Flammulated owls are typically associated with large ponderosa pine and Douglas fir trees on south and western slopes. Suitable habitat varies from open, large ponderosa pine (with little under-story) to multi-layered and closed-canopies. This owl preys only on insects and typically forages in the edge habitats between forest and grassland, as well as in forests of low or moderate density. Breeding territories are typically located near open areas, including old burns, grassy hillsides, natural clearings and some logged areas. They often nest in cavities previously constructed by flickers or pileated woodpeckers.	The project areas do not contain suitable habitat for the flammulated owl.
Black-backed woodpecker P*icoides arcticus*	Large burned forests during early postfire years are potentially important source habitats and believed critical for supporting black-backed woodpecker populations. Burned conifer forests and other insect infested forests provide key conditions necessary for both nesting and foraging.	There are no documented sightings and suitable habitat is very limited in the Lolo and Moose creek project areas.
Harlequin duck *Histrionicus histrionicus*	Harlequin ducks are diving ducks that winter along the Pacific coast and then migrate inland to nest along forested, mountain streams. Harlequin ducks prefer streams in canyons, or meandering and braided streams. They prefer dense riparian vegetation for cover and undisturbed, pristine areas are considered prime habitat for Harlequin duck nesting and brood-rearing activities.	Breeding has not been documented in the Clearwater National Forest, but a few sightings have been reported in the upper Lochsa River area and near the mouth of Papoose Creek (USDE 1997 as cited from USDA 1995). There is a very low probability occurrence in the project areas.

Table 5. Sensitive Wildlife and Management Indicator Species (Cont.)

Species	Habitat Description	Likelihood of Occurrence [a]
Sensitive Wildlife Species		
Western (Boreal) toad *Bufo boreas boreas*	This species utilizes spring pools and slow-moving portions of streams. They generally breed in early July, depending on runoff water during May and June. Tadpole larvae are usually restricted over muddy bottoms where they feed on detritus or filtering suspended plant material. They metamorphose into adults during summer and early fall (Nussbaum *et al*. 1983).	The boreal toad is likely to be present in the project areas since suitable habitat exists.
Coeur d'Alene salamander *Plethodon vandykei idahoensis*	This salamander is usually found in moist, forested areas at moderate elevations below 5,000 feet. They occur in wet, humid and cool microhabitats. Typical habitat features are fractured bedrock or gravel, often under a dense tree canopy, near cascading water. Coeur d'Alene salamanders feed primarily on aquatic and semi-aquatic insects.	Local populations appear to represent the most southern distribution of Coeur d'Alene salamanders. Although there are no reported sightings, some suitable habitat does exist in both project areas.
Northern leopard frog *Rana pipiens*	The northern leopard frog is found in marshes and wet meadows from low valleys to mountain ridges. It is also found in areas virtually devoid of fish, preferring cattail or sedge marshes and weedy ponds for breeding.	There are no known or suspected occurrences of these frogs in the Clearwater National Forest.
A = Likelihood of occurrence as described in USFS (2003b)		

3.0 HABITAT CHARACTERISTICS

This section provides a summary of the most recent habitat data in the stream reaches affected by small suction dredge operations.

3.1 Lolo Creek

Table 6 provides a summary of stream channel and aquatic habitat characteristics in the Lolo Creek project area between the confluences of Eldorado Creek and Yoosa Creek. The stream has predominantly B3 and C3 channel types (moderately confined to confined, low to moderate gradient, cobble reaches). The streambanks are stable due to abundant vegetation and large channel/bank substrate. Cobble embeddedness is greater than the Forest Plan desired future condition of 35 percent embeddedness or less. Lolo Creek is a perennial stream with a bankfull streamflow of about 770 cfs. Flow and stream discharge data and water quality are discussed in the technical background document on hydrology.

Table 6. Summary of Lolo Creek Aquatic Habitat Characteristics [a]

Rosgen Classification	2% A, 46% B, 52% C
Average Gradient	1.1 %
Stream Width	11.0 m
Stream Depth	0.253 m
Thalweg Depth	0.497 m
Bank Stability	4.6 (Stable)
Cobble Embeddedness [b]	45 %
Pool:Riffle Ratio [c]	61 : 39
Acting Debris / Potential Debris [d]	4 / 13
Pool Quality	2.6 (Good)
Instream Cover	2.3 (Moderate)
Bank Cover	1.1 (Sparse)

a = Averages derived from 1998 summer stream survey data between Eldorado Creek and Yoosa Creek (Clearwater BioStudies, Inc. 1999a).
b = The target cobble embeddedness rate for the Forest Plan should be less than 35 %.
c = The target pool:riffle ratio is 40:60 for Rosgen B channels and 50:50 for C channels.
d = Acting debris = Pieces of in-channel wood per 100m. Potential debris = riparian conifers available for recruitment into the channel per 100 m. (Forest Plan recommends 40 pieces Acting and 80 pieces potential per 100 meters of stream)

Table 7 provides the average percentages of material comprising the substrate in Lolo Creek between the confluences of Eldorado Creek and Yoosa Creek (Clearwater BioStudies, Inc. 1999a). Data indicate that about 50 percent of the substrate consists of large rubble and boulders, which provides excellent fish rearing habitat. Table 8 summarizes the average percentages of spawning habitat for various fish within the Lolo Creek project reach, based on the 1998 habitat survey (Clearwater BioStudies, Inc. 1999a). Data indicate that steelhead and chinook salmon have the most and resident salmonids the least amount of spawning habitat in Lolo Creek.

Table 7. Average Percent (%) Substrate Composition in Lolo Creek

Bedrock	3.1
Boulders (>30.5 cm)	19.9
Large rubble (15.2 – 30.5 cm)	29.5
Small rubble (cobbles, 7.6 – 15.2 cm)	29.7
Coarse gravel (2.5 – 7.6 cm)	11.1
Small gravel (0.6 – 2.5 cm)	1.2
Sand (<0.6 cm)	4.6
Silt	0.8
Organic debris	0.1

Source: Clearwater BioStudies, Inc. 1999a

Table 8. Percent of Lolo Creek Substrate Available for Spawning

Fish	Good	Fair	Poor	Total %
Resident salmonid (spring)	0.2	0.4	0.5	1.1
Resident salmonid (fall)	< 0.1	0.2	0.6	0.8
Steelhead trout	1.6	6.1	4.2	11.9
Chinook salmon	0.3	2.9	6.1	9.3

Source: Clearwater BioStudies, Inc. 1999a

Riparian habitat is comprised mostly of large conifers, with western red cedar (*Thuja plicata*) dominant, followed by grand fir (*Abies grandis*), spruce (*Picea spp*.), alder (*Alnus spp*.), willow (*Salix spp*.), and dogwood (*Cornus spp*.). Mixed shrubs, forbs, and grasses are subdominant along the creek.

3.2 Moose Creek

Table 9 provides a summary of aquatic habitat characteristics of Moose, Independence, and Deadwood creeks in the project area. Moose Creek habitat conditions vary; upstream from Deadwood Creek the stream has steep gradients and excellent fish habitat; between Deadwood and Independence creeks the gradient is moderately steep with habitat affected by past placer mining; between the Independence and Osier creeks the gradient is moderately steep to steep with habitat characteristics changing with changes in channel confinement; and downstream of Osier Creek Moose Creek has a wider floodplain, is more sinuous, and has a relatively flat stream gradient.

Independence Creek is moderately steep and dominated by large substrate, with sparse instream cover and moderate streambank cover. Deadwood Creek is steep with sparse instream and streambank cover conditions and the greatest amount of woody debris of all three streams.

Table 9. Summary of Aquatic Habitat Characteristics in the Project Area [a]

Habitat Parameter	Moose Creek	Independence Creek	Deadwood Creek
Rosgen Classification	42% A, 45% B, 13% C	B3-B5 100%	A2/A3 100%
Average Gradient	4.8 %	3.2 %	5.5 %
Stream Width	8.2 m	2.8 m	3.0 m
Stream Depth	0.198 m	0.133 m	0.123 m
Thalweg Depth	0.38 m	0.255 m	0.236 m
Bank Stability [b]	4.4 (Stable)	4.5 (Stable)	4.8 (Stable)
Cobble Embeddedness [c]	22.5 %	33.5 %	25.3 %
Pool:Riffle Ratio [d]	9 : 59	15 : 51	25 : 63
Acting Debris / Potential Debris [e]	6 / 20	17 / 20	23 / 72
Pool Quality	1.5 (Poor)	1.6 (Poor)	1.0 (Poor)
Instream Cover	1.6 (Sparse)	1.5 (Sparse)	1.3 (Sparse)
Bank Cover	1.3 (Sparse)	2.1 (Moderate)	1.6 (Sparse)

a = Averages from 1990 summer stream survey (Clearwater Biostudies, Inc. 1991)
b = Largely due to abundant vegetation and large channel/bank substrate.
c = The target cobble embeddedness rate for the Forest Plan should be less than 35 %.
d = The target pool:riffle ratio is 40:60 for Rosgen B channels and 50:50 for C channels.
e = Acting debris = Pieces of in-channel wood per 100m. Potential debris = riparian conifers available for recruitment into the channel per 100 m. (Forest Plan recommends 40 pieces Acting and 80 pieces potential per 100 meters of stream)

Table 10 shows substrate composition in the Moose Creek drainage in the project area (Clearwater BioStudies, Inc. 1991).

Table 10. Average Percent (%) Substrate in the Moose Creek Project Area

Size Category	Moose Creek	Independence Creek	Deadwood Creek
Bedrock	1.6	0	0
Boulders (>30.5 cm)	8.0	12.5	1.3
Large rubble (15.2 – 30.5 cm)	33.3	8.0	17.9
Small rubble (cobbles, 7.6 – 15.2 cm)	47.7	34.3	53.0
Coarse gravel (2.5 – 7.6 cm)	6.5	32.6	20.0
Small gravel (0.6 – 2.5 cm)	1.3	8.8	5.8
Sand (<0.6 cm)	1.1	2.4	2.0
Silt	0.2	0	0
Muck	0.1	0	0
Organic debris	0.2	1.6	0

Source: Clearwater Biostudies, Inc. 1991

Data indicate that cobble and rubble substrate dominates Moose Creek; coarse gravel and cobble dominate Independence and Deadwood creeks (Table 10). These substrate sizes provide some

spawning habitat and substantial rearing habitat. Table 11 summarizes the average percentages of spawning habitat for resident salmonids in Moose Creek and its tributaries in the project area, based on the 1990 habitat survey. Data indicate a limited amount of available spawning for the three creeks.

Table 11. Percent of Moose Creek Project Area Available for Spawning [a]

Fish	Good	Fair	Poor	Total %
Resident salmonid (spring)	0.13	0.16	0.07	0.36
Resident salmonid (fall)	0.11	0.12	0.05	0.28

a = Combined average for Moose Creek, Independence Creek, and Deadwood Creek based on habitat area.
Source: Clearwater Biostudies, Inc. 1991

Riparian habitat in Moose Creek varies considerably but is comprised mostly of mixed shrubs with an overstory of alder, spruce, and mixed conifer trees. However in Independence and Deadwood creeks, spruce, mixed conifers, and alder trees dominate. Along all the streams, mixed shrubs, forbs/grasses, and small alder were subdominant.

4.0 ANALYSIS OF SUCTION DREDGING EFFECTS ON FISH AND WILDLIFE

This section presents information on the impacts of small suction dredging operations to fish and wildlife resources.

4.1 Impacts to Fisheries

The total habitat area of Lolo Creek within the project area is 189,315 square meters (Clearwater BioStudies, Inc. 1999a). Because small suction dredges use nozzles from two to five inches in diameter, the substrate size fractions subject to entrainment range from silt fines to small rubble (3-5 inches diameter). These size fractions comprise about 99,036 square meters or 52 percent of the streambed in the Lolo Creek project area. Thus, a reasonable maximum level of disturbance by dredge operators could occur to about one-half of the aquatic substrate habitat.

There could be up to 18 proposed plans for operation in Lolo Creek. If 18 suction dredges operated the entire season, then the estimated total disturbance could reach 8 square meters of stream bottom per day for 46 days. This would result in 6480 square meters of direct disturbance (8 square meters x 18 operations x 46 days) during a season, which would represent about 7 percent (6480 ÷ 99,036) of aquatic habitat.[1]

Based on past dredging operations, potential maximum downstream measurable indirect effects from turbidity and sedimentation would occur within 100 meters (325 feet) of direct operations (based on research from Royer *et al*. 1999), so this would add another 9,000 square meters to the potentially disturbed area (100 meters length x 5 meters width x 18 operators). Thus, there could be indirect effects over about 9 percent of the aquatic habitat in Lolo Creek (9,000 ÷ 99,036). As noted in section 4.3.2, there is very little fine material (material <0.25 mm in diameter) in Lolo Creek and so the potential for added turbidity is relatively low. As a result, effects from turbidity would not occur in nearly this large an area.

When a similar approach is applied to the Moose Creek study area, up to 38 simultaneous dredge operators would impact approximately 80 percent of the aquatic substrate habitat. The maximum area of potential direct disturbance would be about 10 percent of the available habitat area meeting substrate sizes, and about 9 percent of total aquatic habitat for potential indirect impacts.[2]

[1] This is the maximum area that could be disturbed, but the area that is reasonably likely to be disturbed in any given year would be much smaller. In 2001, for example, there were only eight section dredge operations in Lolo Creek. Of these, only two dredged for close to a full season (46 days), while the other six were active for only one or two weeks.

[2] Again, this is the maximum area, and again the actual area disturbed would be much less. In 2001, the Forest Service received 11 proposed plans of operations for Moose Creek, Independence Creek, and Deadwood Creek. Of these, only three dredged for the full season, while the rest dredged from a weekend or two up to several weeks.

4.1.1 Direct Impacts to Fish

The window for dredging operations occurs from July 1 to August 15. This minimizes impacts to most larval and juvenile fish, and occurs after steelhead trout and bull trout emerge from the substrate.

Mortality and Injury. Salmonid alevins are the larval stage between the egg and the free-swimming fry or juvenile. They develop from eggs deposited in gravels of the redd. Dredge-related mortality of alevins can occur in three ways. First, they could be crushed underfoot when operators cross streams while moving in gear and mining equipment. Redds are typically located in shallow, flat gradient stream areas that afford good footing for those crossing a stream. Secondly, alevins could be entrained through the intake pipe. Entrainment could kill alevins immediately or cause injuries or stress that could cause delayed mortality (Griffith and Andrews 1981). Thirdly, debris tailings and fine sediment could be deposited on a redd, trapping or suffocating alevins from excess fine sediment deposition or oxygen depletion.

Another mortality factor would be fish eggs, larvae, and alevins that become entrained by small suction dredge operations. Griffith and Andrews (1981) found high mortality of entrained eggs of cutthroat trout before eye-up but mortality was less as eggs matured. Cutthroat trout sac fry suffered more than 80 percent mortality from suction dredging entrainment compared to a 9 percent natural mortality rate. They speculated that entrainment would likely kill larvae of other fish species and that eggs, larvae, and fry surviving entrainment could suffer from subsequent predation and stress. Juvenile and adult salmonids would likely avoid or survive passage through a suction dredge (Harvey and Lisle 1998). Post-emergent salmonids would also be vulnerable until they are large enough to avoid entrainment. Juvenile and adult salmonids would normally be able to avoid entrainment (Harvey *et al*. 1995).

Steelhead trout and chinook salmon would likely be most affected in Lolo Creek due to the potential for more spawning and egg deposition in areas that could be dredged (Section 3, Table 8). However, the likelihood of impacts are considered very low due to the small area of disturbance that may overlap with spawning habitat and the fact that suction dredging operations would not begin until most steelhead have emerged from the redds, and cease before most chinook spawn (July 1 through September 15). Suction dredge operations are only allowed to be located in areas of large substrate not preferred for spawning steelhead trout and bull trout. In addition, operators must meet with a Forest Service fisheries biologist who will inspect the site area for redds prior to commencement of dredging. Furthermore, to avoid fish entrainment, operators are required to use a 3/32 mesh screen for their intake hoses.

Disturbance and Dislocation. Suction dredging could disturb salmon holding in deep pools during summer, particularly if numerous dredges are operating or water temperatures are elevated (Somer and Hassler 1992).

Dredge piles that span the stream channel are not permitted, although some operators may create temporary partial barriers in order to increase flotation of their dredge in shallow areas of the creeks. Temporary dredge piles that span a substantial portion of the stream width could affect the normal feeding and escapement behavior for juvenile salmonids and other small fishes

(Harvey and Lisle 1998). This could cause the affected fish to undergo stress and reduced vigor, or fall prey to predators. These temporary dredge piles would generally not persist through the normal peak flow events. When large amounts of substrate are deposited over cobble habitats, riffle sculpin (*Cottus gulosus*) could be displaced (Harvey 1986). Since cobble substrates are usually not limited in stream reaches of Lolo and Moose creeks, riffle sculpin could quickly disperse to new locations.

Suction dredging will dislocate and kill a small number of aquatic insects used as a food source by a variety of fish species and life stages (see Section 4.1.3). This would occur in the immediate vicinity of the suction dredge and fish in the local area would be forced to relocate to find food. Fish relocating to new feeding areas may experience increased stress due to predation, exposure to suboptimal habitat conditions, or increased competition with other fish.
Changes in Water Temperature. Elevated water temperature affects fish metabolism, development, and activity. It lowers the amount of oxygen available to fishes and can induce stress, disease, and mortality. Juvenile and resident salmonids are at risk when temperature exceeds 23-25 degrees Celsius (Spence *et al*. 1996).

The Proposed Action would not affect stream temperature beyond the actual site where suction dredging is occurring. Shade trees would not be cut and the width-to depth ratio of dredged channels would not be sufficiently increased to cause solar radiation to increase stream temperature. Pool temperature could be slightly reduced in excavated pools if cooler groundwater is intercepted or deepened pools cause stream flows to stratify. This effect would likewise have little influence on stream temperature beyond the immediate area of suction dredging operations. However, the influences of suction dredging in streams with elevated water temperatures could produce synergistic effects (USFS 2001).

Changes in Sediments and Turbidity. Fine sediment and turbidity would increase during dredging. In those areas where small amounts of fine sediment are being worked and stream flows are high, only small increases in turbidity would be detectable and the effects would be small and short duration. If large amounts of fine sediments are encountered and stream flows are low or moderate, detectable increases in turbidity would be expected at the site and could extend a hundred feet or more downstream.

Royer *et al*. (1999) evaluated effects from both 8-inch and 10-inch commercial suction dredge operations. They found that although turbidity and total filterable solids increased downstream of the dredge, the values returned to upstream levels within 80-160 m downstream of the dredge. Turbidity values for the 8-inch dredge were approximately 25 NTUs in the immediate area of suction dredging operations, but fell to less than 5 NTUs within 40 m downstream. Furthermore, the effect of the turbidity plume was limited to approximately 7 percent of the river width.

Research has found the feeding ability and health of sculpin and salmonids are not significantly impaired by the increased turbidity of suction dredging (Hassler *et* al. 1986). While significant increases in turbidity can stress juvenile salmonids, especially through gill irritation, it would not likely cause mortality (Bash *et al*. 2001). In areas of concentrated suction dredging, the amount of fine sediment deposition would be cumulative. Mobilized fine sediment would settle downstream within slow water velocity areas such as pools. It is unlikely enough fine sediment

would be deposited to measurably reduce pool size. However, significant increases in deposited fine sediment could reduce overall habitat quality for salmonids by filling in of interstitial spaces used by juveniles and by reducing the distribution, diversity, and abundance of benthic invertebrates used as prey items (Hassler *et al*. 1986). Fine sediment deposited during the operating season would likely be routed through the stream system during the normal peak flow event.

Fine sediment from vehicular travel on unimproved substandard access roads and trails and on hardened stream banks could be delivered to streams. However, the amounts would likely be small and not detectable.

The substrate sizes in Lolo Creek and Moose Creek are dominated by cobbles and boulders (Section 3, Tables 6 and 9) and large quantities of fines are not expected. In addition, suction dredging often targets bedrock cracks below the gravel/cobble layer where even fewer fines are located.

Chemical Contamination. Fuel, oil, and grease could be spilled into the creeks and affect aquatic resources. However, these products would be stored in areas that minimize the opportunity for accidental spillage into the stream. Refilling instream equipment is limited to one gallon at a time in the presence of absorbent material. Small amounts of grease, gasoline, and motor oil could be spilled into the stream during suction dredge operations and it is conceivable that a gallon or two could be spilled annually.

Some dredge operators camp for several weeks in undeveloped sites near streams without proper toilet facilities. Some water contamination could result from lack of proper toilet facilities (fecal coliform), improper disposal of garbage, and use of soap and detergents.

4.1.2 Impacts to Instream Habitat

Substrate. The proposed action does not limit the amount of substrate material that could be dredged in a particular claim or river segment, provided separate operators are at least 100 feet apart. Deposited substrate material could be piled or spread out. In addition, rock too large to pass through the dredge nozzle (generally greater than 5 inches) would typically be hand piled in or along the stream channel. These dredge piles and hand placed rock could deflect stream flows and cause localized scour and deposition. These larger substrate materials would have to be replaced in the dredge holes by the operators by August 15. In addition, the dredge piles of substrate would likely be scoured-out during normal high flow events, except in drought years.

Woody Debris. The proposed action does not allow instream wood (generally larger than six inches in diameter and three feet in length) to be removed or cut from the stream channel. Dredging of sediments could destabilize instream wood potentially reducing its stability and causing it to move from its natural location. Destabilizing instream wood could reduce pool frequency and quality and streambank stability.

Some operators may cut streamside shrubs or trees they feel pose a hazard to their operation. This could reduce stream shade. Felled trees recruited to stream systems would have less ability to form quality pool habitat than intact trees because they lack their stabilizing root wad.

Stream Channel Condition. Small suction dredging operations could increase pool frequency where dredging excavates pools and could decrease pool frequency where pools are filled by deposited tailings. An increase in pool frequency could temporarily improve stream channel diversity, a condition beneficial to many fishes and aquatic organisms. However, if excavated pools dry up during late summer, fish and aquatic organisms using them could become stranded and loose vigor or die from intolerable environmental conditions or succumb to predation. Dredge holes (excavated pools) would likely be filled in during normal high flows except in small stream channels or during drought years. The proposed action calls for backfilling of all pools created.
Suction dredging could alter pool dimensions and quality; through excavation, dredge pile deposition, or changes in channel morphology. Excavating pools could substantially increase their depth and increase cool groundwater inflow. This could reduce pool temperature (Harvey and Lisle 1998). If pools were excavated to a depth greater than three feet, salmonid pool habitat could be improved. In addition, if excavated pools reduce pool temperatures, they could provide important coldwater habitats for salmonids living in streams with elevated temperatures. Deepened pools would likely return to their original depths following the high flow events.

Suction dredging is likely to occur in the main stream channel as there are very few potential off-channel habitats in the Lolo Creek and Moose Creek project areas. It is possible, although unlikely, that dredging piles could temporarily block off-channel habitats from the normal stream flow during the operating season. However, any off-channel habitats would be hydrologically restored during high flow events.

Suction dredging could locally alter the channel width/depth ratio. Where channels are excavated, depth is increased. Where tailings are deposited, the depth is decreased. However, it is unlikely small-scale suction dredging would change the width-to-depth ratio beyond the immediate area of operations because of the relatively small amount of stream channel that would be excavated or filled with tailings. Assuming a maximum width of 2 m for a dredge pile, this would be less than 25 percent of the average stream width of Lolo Creek and Moose Creek. The average stream widths for Independence and Deadwood creeks (in the Moose Creek project area) are about 3 meters.

Some dredge operators may build temporary rock barriers to facilitate flotation of dredges. These small barriers would usually be needed for a few hours to a few days. If properly constructed, they generally would not block adult fish passage but could inhibit normal juvenile salmonid feeding behavior and escapement from predators while in place.

Dredge tailings deposited in small streams reduce channel depth. This could inhibit upstream and downstream movement of aquatic organisms, including sculpins and juvenile salmonids (Harvey and Lisle 1998). Fish and other aquatic organisms could be denied access to important habitats needed for survival. Any stranded fish and other aquatic organisms would be vulnerable to mortality through predation or exposure to intolerable environmental conditions. These

blockages would generally not persist through high flow events even if not dismantled after operations.

Bank Stability. Suction dredge piles could re-direct stream currents into stream banks and cause localized bank erosion. When large rock, boulders, and instream wood are dislodged from pools and along stream banks, stability could be reduced. Excavated pools near streambanks could cause eventual bank collapse and reduced stability. Hand piling of rock too large to pass through a dredge could redirect stream flows into banks causing localized bank erosion. However, if followed, operator guidelines should prevent destabilization of streambanks.

Some camping occurs in association with suction dredging. In some instances, entire families or groups of miners camp together for days to weeks at a single location. Since, some of the camping could occur along streambanks and outside of designated campgrounds, some destruction of riparian vegetation and hardening of streambanks could occur. Miners could collect firewood from within the stream recruitment zone and reduce wood available for stream bank stabilization and other stream processes.

Flow/Hydrology. No effects would be expected to existing peak and base flows of the affected creeks. Operators sometimes use poorly located and constructed roads and trails to access their claims. Roads and trails that lack proper drainage features (e.g. culverts and ditches) could intercept precipitation and stream flow and redirect water away from the normal drainage network. Many of these access roads and trails are not maintained or repaired by the Forest Service.

4.1.3 Impacts to Aquatic Invertebrates

The operation of small-scale suction dredges would be expected to displace some insects downstream but result in minimal amounts of injury or mortality to aquatic insects. Suction dredging effects on immature fish, aquatic insects, and other invertebrates were assessed in the Yankee Fork (tributary to the Salmon River near Stanley, Idaho) and Bums Creek (tributary to the South Fork Snake River) in 1980 by Griffith and Andrews (1981). They found that less than one percent of 3,623 macroinvertebrates entrained through a three-inch dredge nozzle displayed injuries or died within 24 hours. The mortality rates varied by species but were highest among emerging mayfly species. Most of the re-colonization of the dredged areas by aquatic invertebrates was complete after 38 days.

Exposure of previously buried substrate and covering of existing substrate can locally reduce abundance of benthic invertebrates. However, most aquatic invertebrates species have a life history capability of re-colonizing disturbed sites within several weeks.

Royer *et al*. (1999) found that the density of aquatic invertebrates was greatly reduced in the first 10 m below an 8-inch commercial suction dredge. The abundance and diversity of invertebrates returned to values seen at the upstream reference site within 80 to 160 m downstream of the dredge. The authors reported that recovery of invertebrate diversity appeared substantial within one year after dredging. Royer *et al*. (1999) also evaluated the impacts of small-scale recreational suction dredging on invertebrates approximately 5 weeks after dredging operations

ended for the year. They found that aquatic invertebrate density, taxa richness, and EPT richness were not significantly different between the dredged areas, 35 m downstream, and the upstream reference sites. Where dredging moves substantial amounts of substrate occupied by aquatic mollusks, re-colonization would take much longer because of their low dispersal rates and limited distribution within river systems (Harvey and Lisle 1998).

Dislodged fine sediment would be distributed downstream of the dredged area and could temporally fill interstices in gravel and cobble, reducing available macroinvertebrate habitat in the immediate area. Scouring action during the next high flow would likely clear out sediment accumulations and allow aquatic insects to re-colonize the habitat. However, continued intensive dredging of multiple claims could cumulatively reduce the habitat quality over specific areas. Thomas (1985) reported significantly lower aquatic insect abundance in a 35-foot section of stream that had just been dredged, compared to a site downstream of the operation, although re-colonization was substantially complete within one month after the dredging.

4.1.4 Summary of Impacts to Threatened and Endangered Fish

Chinook Salmon. No impacts are expected to fall-run chinook salmon because the closest distance to fall-run essential fish habitat is over 25 miles downstream from the Lolo Creek project area, and over 100 miles from the Moose Creek project area due to the Dworshak dam that provides a complete barrier to anadromous fish migration.

Available spawning habitat for spring chinook salmon is approximately 1.1 percent of the aquatic habitat in the Lolo Creek project area (Section 3). Spring chinook salmon are supplemented by hatchery fish and there are sizable densities of chinook juveniles in Lolo Creek. The dredging operations work window occurs several months after spawning. Short-term impacts to juvenile chinook could occur during the dredging window. These impacts would be limited to displacement or avoidance during the hours of dredging activity and the localized reductions in macroinvertebrate food availability.

Steelhead Trout. The Lolo Creek steelhead population is a combination of natural and hatchery fish, and it produces very few natural steelhead due to poor adult returns and habitat conditions. Approximately 12 percent of Lolo Creek within the project area is available for steelhead trout spawning habitat, but less than 2 percent is considered good spawning habitat (Clearwater BioStudies, Inc. 1999a). The dredging operations work window occurs after most steelhead emerge from the substrate. Small-scale suction dredge operations will have a negligible impact on adult steelhead or their spawning gravels because spawning occurs 5 to 6 months later during spring flows that naturally redistribute the substrate, and after re-colonization of macroinvertebrates. Short-term impacts to juvenile steelhead trout could occur during the dredging window as fish are displaced away from dredging activity and from localized reductions in macroinvertebrate food availability.

The Biological Opinion for suction dredge mining in Lolo Creek (USFWS 2003) stated that the 18 projects proposed for 2003 suction dredging would not likely jeopardize the continued existence of the Snake River steelhead. Due to the natural redistribution of substrate and re-colonization of the dredge areas between August 15 and July 1 every year, the potential for

cumulative impacts from many years of small-scale suction dredge operations are not anticipated.

As with chinook salmon, steelhead trout do not exist in the Moose Creek drainage due to the presence of Dworshak Dam.

Bull Trout. In the Lolo Creek project area, no bull trout have been identified since 1995, despite extensive fish surveys, and only 6 bull trout were identified from 570 survey stations in Lolo Creek starting in 1987. The window of suction dredge activity is during a period that minimizes the likelihood of bull trout being present or spawning in the project area. In August 2002, the U.S. Fish and Wildlife Service concurred with the Forest Service's determination that the small-scale suction dredging proposal for the 2002-2003 season may affect, but is not likely to adversely affect bull trout (USFWS 2002).

In the Moose Creek project area, bull trout presence has been documented by several sources, but bull trout numbers have been relatively low up to the year 2000. Between 1984 and 2001 bull trout were found at 7 out of 97 snorkeling stations. However, higher numbers of adult bull trout have been found in snorkeling surveys since 2000 (USFWS 2003). Moose Creek, proposed as critical habitat, has excellent for bull trout rearing but available for spawning habitat is less than one percent (Clearwater Biostudies, Inc. 1991). The impacts of small-scale suction dredging on bull trout eggs, alevins, or fry are expected to be minimal because bull trout hatch in January and February, and remain in the gravel until April or May; and leaving the gravel before the dredging work window. Disturbance to fry would be limited to short-term impacts that would occur during the dredging window, such as temporary displacement during the hours of dredging activity and localized reductions in macroinvertebrate food availability. The impacts to instream habitat conditions (discussed in Section 4.1) would be minimal, especially due to the existing and proposed conservation measures required in permits for dredging operations that are discussed in Section 2.3 of the companion draft EIS.

Westslope Cutthroat Trout. Impacts to cutthroat trout would be similar to those for steelhead trout and bull trout mentioned above. Cutthroat trout populations are higher relative to steelhead and bull trout and much of their spawning habitat is in the small tributary streams.

4.2 Impacts to Wildlife

The impact of suction dredging on terrestrial wildlife is focused predominately within the riparian zone and in the operational sites (including camps) along the streams. Aquatic amphibians (e.g., boreal toad) can be affected through entrainment of eggs and young in the early stages of development. Existing permit restrictions prohibit suction dredging into the banks of streams that could potentially cover amphibian eggs and preferred habitat. The permit stipulations also prohibit damage to riparian habitat, which is used extensively by amphibians.

Terrestrial species, including most birds, mammals, reptiles and some amphibians are not likely to be adversely impacted by suction dredging, although they may be disturbed by the activities (primarily from equipment noise and camp activities) to the point where they temporarily abandon some areas of preferred habitat. Large animals frequenting riparian areas have relatively spacious territories, and will simply avoid the dredging sites. For example, suction

dredging activity may prevent an aquatic fur bearer from foraging in the area, but other nearby sites are likely to be available within its territory.

Existing permit conditions provide substantial protection for vegetation habitat along streams. This provides for long-term wildlife use of the area, especially during 10 months of each year when dredging operations are not allowed.

Impacts to threatened, endangered, or sensitive wildlife species are considered negligible. For example, dredging activities would not occur during the winter months when bald eagles may winter along the Clearwater River. Additionally, grizzly bear, lynx, and gray wolves are not known to inhabit the project areas. For at least 10 months of the year, the temporary noise and other human impacts associated with small-scale dredging would not likely jeopardize the continued existence of the gray wolf (USFWS 2002), and would result in no adverse effect on bald eagles, grizzly bear, lynx, or their habitats (USFS 2002a,b).

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